WHAT MICRO?

100 THINGS YOU WANTED TO KNOW ABOUT COMPUTERS

LOGIC 3

LOGIC 3

— THE KEY TO THE WORLD OF TOMORROW.

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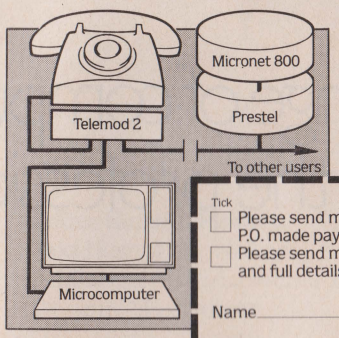

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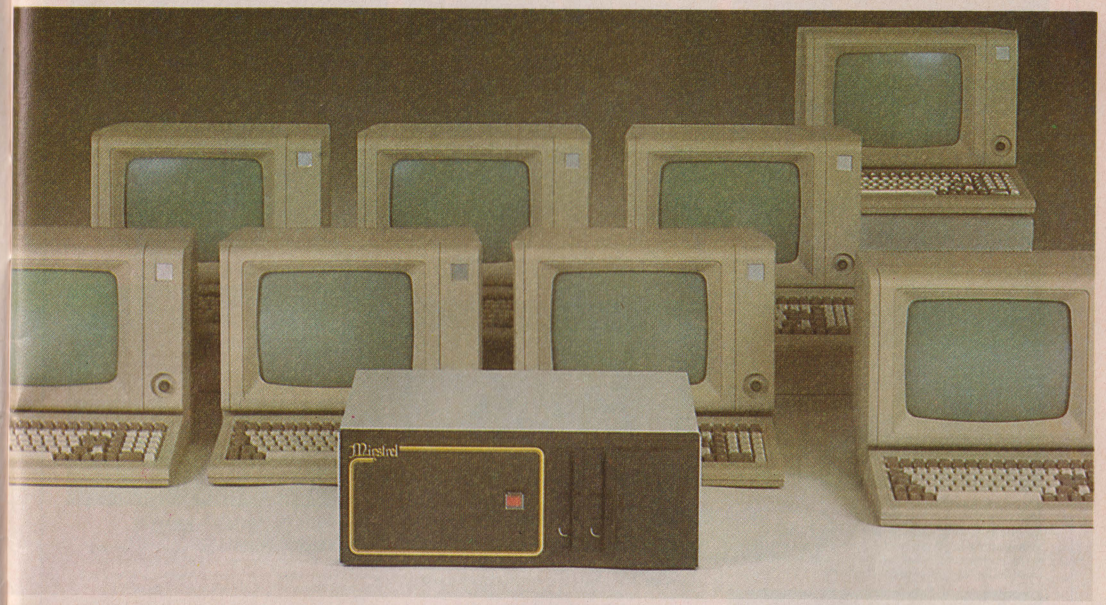

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Each user has their own 8-or 16-bit computer, networked together inside the Minstrel, to run CP/M-80 or CP/M-86 compatible software.

Compatability

Record-locking compatability with MP/M means standard multi-user languages and packages are suitable for Minstrel TurboDOS systems.

Expandability

Using the ARCNET local area network up to 256 Minstrels of up to 6 terminals each may be linked together. Each Minstrel system may have up to 160Mb of Wincheser storage.

Sophistication

The Minstrel Turbo is a true networking system with resource-sharing. Up to 9 spooled printers per Minstrel are accessible from any processor.

Versatility

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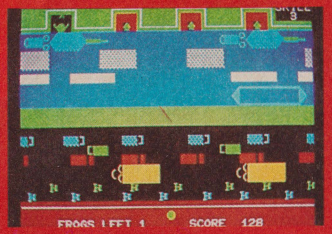
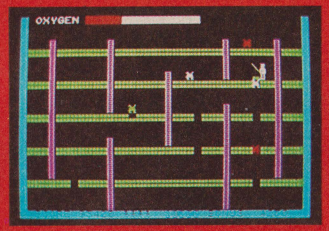


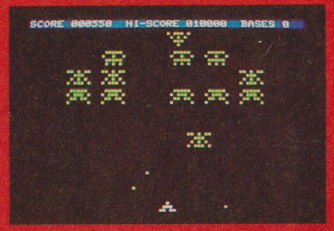
FROGGER — £6.95

This most popular of arcade games has been totally recreated for the Sharp computer. Superb graphics and as fast as you like from beginner's level up to 'Super-human'. Get each of four frogs over the busy motorway, then hop from boat to raft to log to crocodile until safely home sitting on a lily pad. Terrific fun.



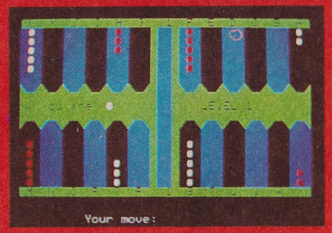
SPACE PANIC — £7.95

How long can you survive in the multi-storey building filled with alien bugs. This machine-code programme accurately simulates the arcade game where you climb ladders and dig holes to catch the aliens then fill them in again once they are caught. The red ones must fall through one floor, the green ones, two floors and white ones, three floors. Red aliens who have time to dig themselves out get rather cross and become green. PANIC!! Joy stick or keyboard control.



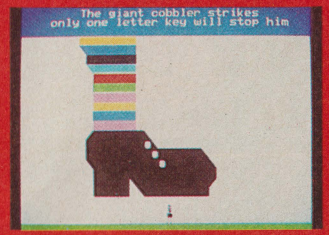
GALAXIANS — £7.95

A high-speed machine-code version of the popular arcade game where the massed space invaders must be cleared from the skies. After a few seconds they will begin to swoop and dive at you, showering you with scatter bombs as they go. The game becomes progressively more demanding as you kill more and more of the marauding aliens. Very entertaining — hours of fun!!! Joy stick or keyboard control.



BACKGAMMON — £7.95

Now available for the MZ-700, this traditional board game can now be played against the computer. Simple to follow instructions for the beginner — higher levels available for the more experienced player.

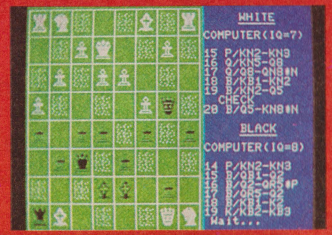


NIGHTMARE PARK — £6.95

If you have never played this type of game before, you're in for a treat. As you make your way along the intricate pathways to the exit, you are constantly given tasks to perform or games to play. Each of these must be successfully completed before you are allowed to continue. It takes a lot of doing. You must remain quick and alert at all times. A little luck is handy. Amazing graphics and sounds!!!

FIGHTER COMMAND — £6.95

A mission flown completely on instruments where you are pursuing a fleet of ten enemy aircraft fleeing from you. They will show on your long range radar screen and you must manoeuvre your craft to get them within range of your missiles. If you get too near, they will fire at you and warp away to safety. You only have one chance to destroy incoming missiles with your lasers.



CHESS — £9.95

Suitable for the rank beginner through to the more experienced player, this Chess program may be used in three different ways.

1. As a referee between two players, checking for valid moves, CHECK and CHECKMATE situations.
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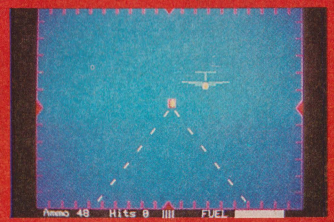
3. As a teaching aid when asked to play against itself or show you the best move if you get into difficulties.

Long games may be saved on cassette for completion at a later time and a print-out of all moves made is available.

XANAGRAMS — £9.95

Not only a terrific spelling test but also a great game. You are asked to guess up to five words, represented by blocks on the screen in a crossword format. All the letters that you need are shown on the right of the screen in alphabetical order and the computer will give you the first letter if you ask it nicely. Suits almost any age with 3 skill levels and from 1 to 5 words to be guessed. Really habit-forming!!!



LIGHTNING PATROL — £3.95

Choose your rank in the RAF and you are immediately sent on a mission to catch and shoot down ten enemy Mirage jets that are fleeing after their attack on your airbase. You must manoeuvre your plane to get them in your gun-sights whilst they are weaving about the sky to avoid being hit. Limited ammunition and fuel available so efficiency and accuracy are all important to your completion of the mission. Promotion for the successful but poor performances can mean you are asked to leave the air force. Joy stick or keyboard control.

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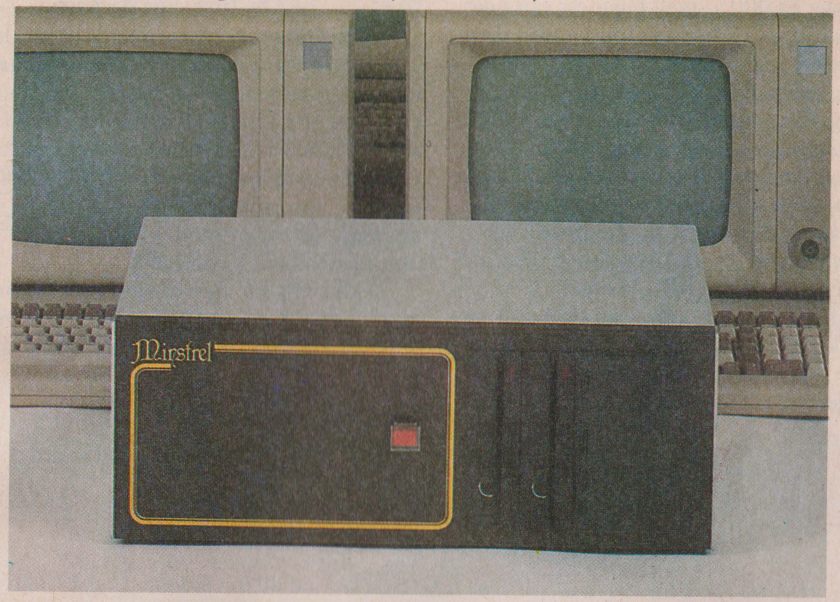

UNIX System III

The Unix operating system is fast becoming a standard for 68000 users: Xenix, MicroSoft's full implementation of Unix System III is supplied complete with an extensive range of software tools and utilities and:

- ★ full C compiler
- ★ Pascal
- ★ Assembler

6 Mbytes RAM

The Minstrel 68K is supplied as standard with 256 Kbytes of DRAM, and additional RAM is available up to a total of 6 Mbytes.

S-100 bus

The S-100 data bus has become the industry standard, having been adopted as an official standard by the IEEE. S-100 is by its nature future proof.

16 Users

The Minstrel 68K comes with two user ports as standard, and can easily be expanded with multiple I/O boards to a total of 16 users.

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Price v Power

The Minstrel 68K starts at £6995 (plus VAT) in its standard form, including Xenix, 8 MHz memory-management unit and 20Mb Winchester.

The Minstrel 68K offers the following features:-

- ★ 32-bit internal architecture
- ★ 8Mhz operation using 256K RAM cards
- ★ Memory mapped I/O
- ★ Boot PROM with system confidence test
- ★ Programmable real-time clock
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Introduction

The industrial world is in turmoil. Skills jealously guarded and even more jealously handed over for over four generations seem suddenly to be no longer needed; companies slow to adapt to the new technology are dying; a new technological elite is emerging. Computers are changing the world.

The issues as seen by the mass media are: jobs, productivity and being able to compete on the international market. Of course, all these matters are very important, but they represent only the tip of the iceberg of the new problems and opportunities being created by the application of computer technology.

150 years ago, the nationwide application of steam technology produced such far reaching changes that the process is described today as the industrial *revolution.* The historical experience of the industrial revolution provides a useful insight into the changes that *we* can expect in the near future: when the industrial revolution began, the extent of the coming changes—industrial, environmental and social—were enormously underestimated. The same is even more true today as we hesitate nervously on the brink of the *information revolution.*

After 150 years of adjustment our society has largely adapted itself to the enormous disruptions wrought by harnessing the power of coal and steam. The worst hardships associated with industry have become subject to legislation, its benefits more evenly distributed. The control of industry has become more responsive to the needs of society as a whole. But the changes during the last 150 years have, by no means, all been gradual or painless and some profound problems, such as pollution by acid rain, have yet to be tackled.

It is probable that the effects of the coming information revolution will be even more far-reaching. Changes will not be simply confined to 'technology' jobs replacing jobs in manufacturing or the old professions demanding new skills. Tremendous social issues will be raised by the use or

misuse of computer power.

Already in the 1960s the great cybernetician Stafford Beer postulated the dangers of an 'electronic mafia'—if an individual's purchasing is logged by a computer (Prestel or bank card!) then there is no technological reason why the computer should not be programmed to process all the information on a person's buying habits to produce an almost irresistible individually tailored mail-shot. Maybe it is already being done—is this desirable? Is anybody even asking the question?

Already, in the United States a pilot 'two-way' television network allows some people to 'vote' on their favourite TV programme or act. But this is a trivial application of the new technology compared to the possibility of say, after watching a debate on TV, a whole town voting on whether to adopt parking restrictions in the main shopping street.

Just as there is no technological reason why 6,000 adults cannot decide directly the issue of parking—rather than leaving the matter to six councillors—there is no *technological* reason why a nation of 60 million adults cannot vote directly on whether to spend more on its hospitals, or have land-based cruise missiles. Is this desirable? Is anybody even asking the question?

What of more sinister possibilities? Already in the United Kingdom the Department of the Environment's computer in Swansea 'talks' to computers run by regional police authorities and perhaps to other less well-known computers. So far the British Medical Council has defeated attempts by the Department of Health and Social Security to centralise all medical records on a central computer, so far...!

In 1979, the possibilities of a government's misuse of computer technology were brought vividly home to me personally when I gave an impromptu talk to a group of students in a Polish university on the *recreational* use of microcomputers. After the students had listened intently to my talk, all the 'questions from the floor' were about the implications for individual freedom from computer link-ups of the sort already described. Five years later General Jaruzelski was to demonstrate that today he who controls the flow of information controls a whole country—and his men only grabbed control of *mechanical* telephone exchanges...!

What would life be like in a modern state where a small ruling elite controlled and manipulated all the nation's computers? Computers are important. Much too important for matters relating to their use or misuse to be left to computer professionals, to large corporations or to Government departments. It is the responsibility of all of us to ensure that the right decisions are made during the next few years. It will be our fault, and not 'Big Brother's', if things go wrong.

The low cost and availability of microcomputers makes it possible for everyone to become acquainted at first-hand with the possibilities opened up by computer technology. But having purchased a computer do invest the time to learn to program it yourself. Writing your own programs is not only immensely satisfying, but is the best way to penetrate the jungle of jargon and technical mystique that surrounds computer technology and its applications. Becoming 'computer literate' will enable you to participate fully in the debate regarding the use of computers in the future. As a first step, I hope that '100 Things you wanted to know about Computers' will serve as a guidebook to what may seem at times to be an alien and foreign land.

Andrew Goltz
England, 1984

Some Points to consider before buying

Is buying a computer like buying a car? Different people have different reasons for wanting a car/computer. Some people buy a car to get to work and back; others for taking the family out at weekends; still others buy a car simply because they think they *ought* to have one when in fact they're hardly going to use it at all.

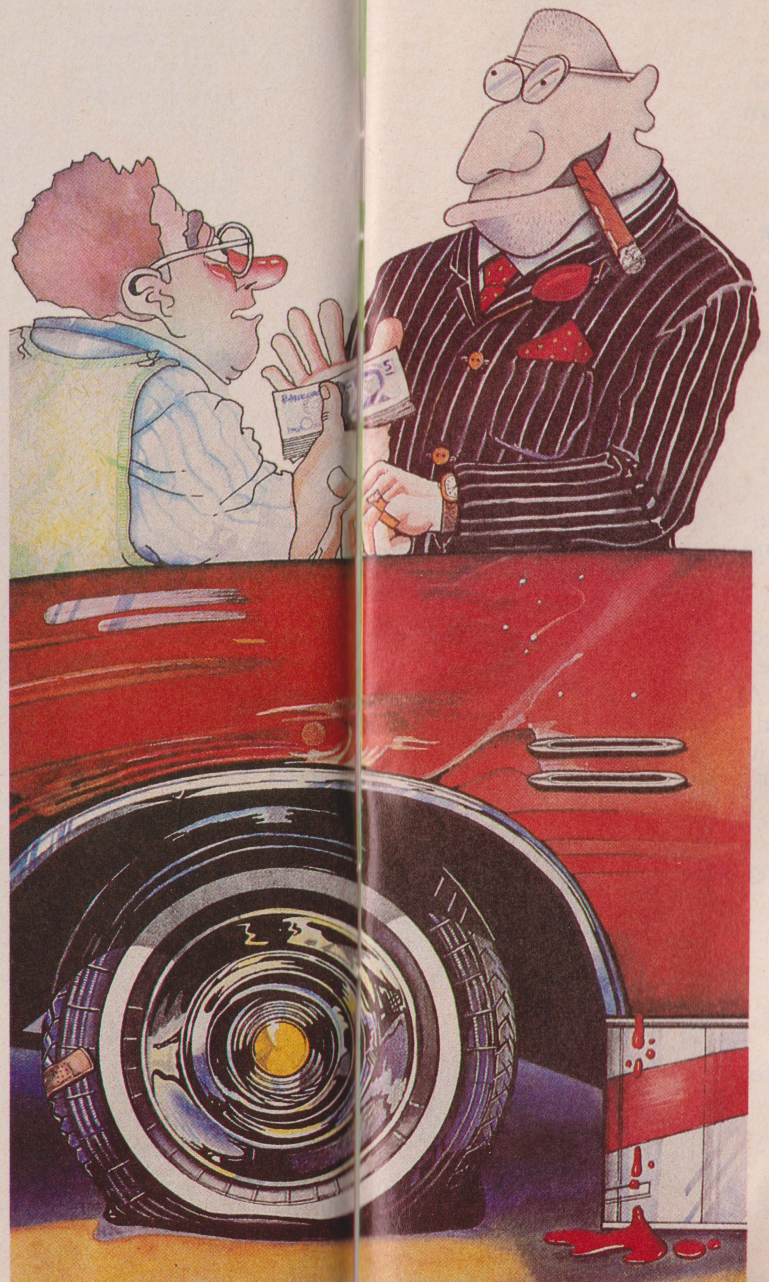
The same applies to people buying computers. Buying a computer can be a very worthwhile investment if you have a specific application in mind, but if you only want it to provide entertainment, or you just feel you ought to have one, there's no need to feel guilty! You may purchase a computer with one purpose in mind, and end up using it for something completely different!

There are plenty of models to choose from. The choice seems endless—just as every day there seem to be more magazines on the newstands to help you choose your dream car, there are now more than 50 publications devoted to microcomputers, packed with advertisements. How should one go about making a choice?

Microcomputers, like cars, fall into several categories. Within each group there are better buys and worse buys, but by and large you do get what you pay for. Though this applies to buying a home-micro, it is not necessarily true of buying a computer for business use; since the numbers involved are much smaller than in the home market, buyers aren't protected by the 'push-pull' forces of a mass market.

Different ways of buying. Whether it's a car, or computer, some people like to buy their equipment in a highly objective manner—drawing up a long list of all the important factors, and evaluating each factor for each machine—more or less a personal WHICH? magazine report. Others, unashamedly buy on looks or because of a 'pet' feature. Quite a few people pretend they are following the first method, but rig the evidence in favour of the machine they have already 'favoured' using the second.

For home computers the best course lies between the two extremes: it helps to understand what some of the jargon and specifications mean (that's what this booklet is for), but some of the most important aspects of a computer (such as the software available) can't be evaluated just by reading a brochure.



Beware—every advertisement should carry a warning. Time was when advertisements simply served to provide information, now the intent is to project an image, whether for selling cars, cigarettes, perfume or computers. One of the most misleading aspects of car and computer advertising is the way the manufacturers identify one particular facility or performance statistic and use it to proclaim that their machine is better than so and so's model.

This sort of misleading 'objectivity' can be particularly hard for the newcomer to identify. In computer advertising, any ad that uses apparently objective comparisons with competitors' products on just a handful of items (such as size of memory, screen, or the speed of operation) should be treated with extreme caution!

A test drive is essential. Few people complete purchase on a new car without trying it out, so don't buy a home computer without a 'hands on' trial. As cars vary in their roadholding, so computer keyboards vary considerably in quality and feel. The clarity and resolution of the computer's screen can be thought of as the instrumentation and controls on the car.

The most important thing, however, is to try out a few pieces of software (games or more serious applications will do) to get some idea of the range and limits of the machine's performance. If you're not a home mechanic or car enthusiast then it's a good idea to have a friend sitting alongside you during the test run. The same applies to choosing a computer, except that you may well find the 'expert' is a good many years younger than you!

Well-known models are a safer buy. You know how it is with cars—you can convince yourself that you have an absolute bargain by choosing a fairly obscure model—twice the engine capacity of the Ford at the same price! But wait until it's time to have it serviced, or you seek quotes for insurance!

Computers, like cars, occasionally need to be repaired, but more importantly, the time will come when you'll want to buy software and perhaps some extra bits and

A few more before to consider buying

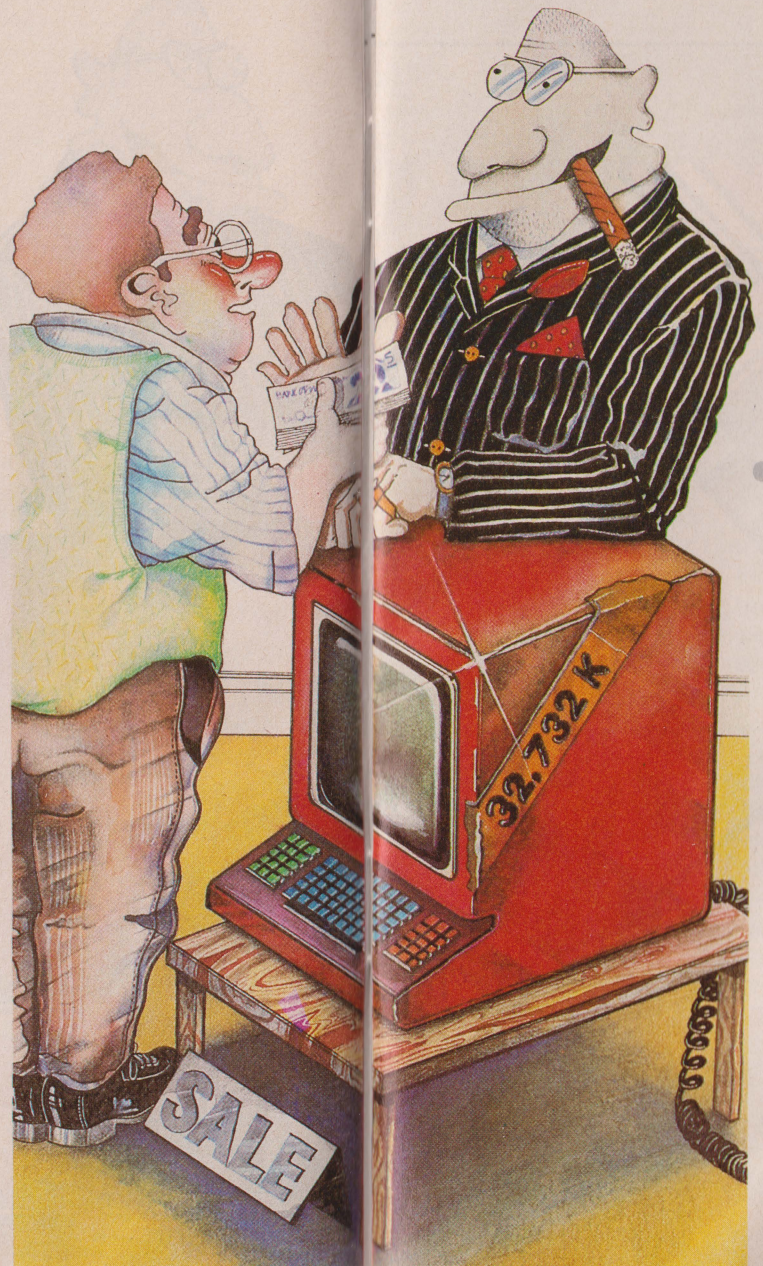
pieces to enhance the performance of your computer. Packages and peripherals abound for the well known makes of microcomputers—go for a more obscure model and you could be searching far and wide.

How to win with salesmen. Computer salesmen, like car salesmen, are a fact of life. You can choose to avoid them by buying from a different kind of outlet (a department store instead of a computer shop for example) but like buying at a car auction, you need to know exactly what you want, because there will be little assistance available to you.

An experienced computer salesman may have accumulated a lot of useful wisdom—which is yours for free, provided you show that you have some idea of what computers are all about (reading this booklet should help). Remember too, that computer salesmen come from different backgrounds; some have graduated up from double-glazing, others are former data processing managers (they look after the large 'mainframe' computers in a large corporation). You will probably find that neither of these is particularly good at understanding your particular needs. The most helpful are usually the pioneer enthusiasts who bought one of the first microcomputers for themselves and became so hooked that they started working with microcomputers full-time.

Problems don't stop when you have bought the thing. At least with a car, you have the option of having it serviced almost anywhere. With a microcomputer, even though it won't need to be regularly serviced, your first port of call for any post-sale needs will probably be the store you bought it from. You may be looking for a particular software package or a printer, or you may just be looking for some help with the operation of your computer (micro-computer instruction manuals are notoriously difficult to understand). You can't expect a complete training course for free, but if you've taken a little care choosing a friendly store, you should be rewarded with helpful and enthusiastic advice when you return.

Don't forget to check the price 'on the road'. A car price may exclude VAT, car tax, delivery and number plates, beware of the hidden costs in buying micros.



These days the mains supply unit is almost always included in the box, as is some form of instruction manual—though you may find the latter so unhelpful that it's worth buying one of the independantly written books for that particular machine.

The cassette recorder is the main thing to watch out for if the computer works with 'any domestic unit', check that the leads and plugs will fit into your model. Some computers only work with the manufacturer's cassette unit, which may cost anything up to an additional £40. The justification for this used to be that being tied into a manufacturer's unit was supposed to give more reliable performance. Take such advice with a pinch of salt. If you need disks or printers, don't forget to check the price of these against the competition and find out if special connecting leads or interfaces are required for these—the price of such 'hidden extras' can be quite a shock.

You don't have to know how it works, but it helps! There are a great many drivers who've never looked under the bonnet of their car, and an even greater number who couldn't tell you how the engine works. But there's no denying that a little knowledge in this direction is not only invaulable if something should go wrong, but actually helps you get a better performance and economy in normal driving.

Even more so with computers, you don't need to learn how to program to use one, because there is an abundance of ready-written programs available over the counter. However, learning to program can give a great deal of satisfaction, and will give you the ability to write an application for the computer that's designed specifically for your situation and no-one else's, and that in turn could result in the computer paying for itself in time or effort saved.

Finally, if you have taught yourself to program, not only will the knowledge so acquired help you tremendously in coming to grips with the jargon of the 'new industrial revolution' of micro-electronics, you will also be a lot wiser when you decide to sell your first microcomputer and purchase a more advanced model.

10 BASIC QUESTIONS

What is a computer?

This is—obviously—one of the first things to get to know about computers. It is also a pretty tough question to kick off with. At its simplest, a computer is a very fast electronic counting machine. There are three basic parts to any computer: the INPUT stage, the PROCESSOR and the OUTPUT stage. In other words you put the stuff in (that's the INPUT), the PROCESSOR then performs its calculations upon the DATA (that's the name for the stuff you put in) and then displays the result upon a video screen or printer (that's the OUTPUT).

With most home micros, input mode is with a typewriter style keyboard and output is to an ordinary domestic TV set. What the processor does to the data depends upon the PROGRAM (a sequence of instructions in the computer's memory). Once the processor has been told what to do, it will run your program as many times as you like. Being simply a fast electronic idiot, it will not get tired or fed up. This is why computers are used to handling quite boring calculations such as gas bills, telephone charges or bank statements. One computer program can handle thousands of items of data in a few seconds and with total accuracy. That's the optimist's view. Conversely, if the machine goes up the creek, the same program can make a pig's ear of thousands of items of data in the same short space of time. It all depends upon your point of view.

What can it do for me?

That depends on you. And that's not meant to be a smart answer. The computer will do whatever you program it to do within reason. It will NOT do the washing up or solve all your personal problems but it WILL be able to help you with financial or business matters if you wish it to. It can handle names, addresses, lists or even teach you a thing or two. Most of all, it will be fun and there's nothing wrong with that. Computer games can be very enjoyable—whether it's chess, space invaders or piloting Concorde. Furthermore, you'll be able to learn about computers and computing which means you'll still have a chance of survival in the silicon 'eighties!

Should I buy one now or wait a year or two?

If you're worried about the price and want to wait till computers get cheaper, then yes you can wait. However, you can buy a simple home-micro nowadays, new or second-hand, for little more than a good night out, so the price won't drop THAT much more in the future.

If you're worried about being 'out of date' by buying now, then please stop worrying. Waiting for a few months before you buy won't help you because by then there will be something else about to arrive on the market. Bear in mind—and it's a sobering thought—that whenever you buy a micro, your computer is out of date the moment you take it home and unwrap it. Why? Because the computer firm is already working on the next model right now! So you might just as well take the plunge and buy one tomorrow.

But I'm a complete beginner. Isn't it very complicated?

Oh, come on now. Everyone has to begin sometime. And it really isn't that complicated. Besides which, if you have children at school, THEY'LL be learning all about computers and you don't want to be left out of their conversations, do you?
FACT: Most schools in the United Kingdom are into computers.
REALITY: School-children are beginners too.

But won't it take over my house with wires and cables and things?

Most micros are no bigger than the average electric typewriter. It is certainly true that cables will run from the computer to your TV set and a cassette recorder, but if they get in the way you can always pack it into a cupboard when you've finished with it.

But what about the dangers? Will we all get 'hooked' on it?

Only if you let it get to you. People can get hooked on many things... watching TV, listening to music, munching chocolate or playing tennis. It's really up to you. If anything becomes an obsession, it's hardly the 'thing's' fault!

Are girls not as good as boys at computing?

What a question! Admittedly, according to one set of statistics, girls are thirteen times *less* likely to take up computers than boys, but that's only *one* survey. If you're female, go out and prove the statistics wrong!

What's all this about Hardware and Software?

The computer world is particularly keen on jargon words. Some of the expressions are appalling but HARDWARE and SOFTWARE are useful words because they neatly sum up computing into two distinct parts. HARDWARE are all the pieces of computing equipment while SOFTWARE are all the programs. If that is still confusing, think of it this way... In a hi-fi system, the turntable, amplifier and speakers are the Hardware, whilst the music you play on them constitutes the Software.

How much will it cost?

You can buy a microcomputer for as little as £40 or as much as £15,000. It all depends what you want it for.

But how much will it REALLY cost?

How far do you want to take it? There are lots of things you can add on to your micro to make it more useful. A complete list of these PERIPHERALS (another jargon word) can be found later on in this book. Some micros come complete with a number of peripherals but the more simple ones—and the cheaper end of the computer market will consist of a basic unit. Your company could spend as much as £1,500 on a decent printer if you want to type letters on the computer but a cheaper one at £200 may serve your needs at home just as well. You could purchase lots of things (floppy disks, joy sticks, a 'mouse' and other strange sounding devices of which more later) but all you need to get started is a *TV set* (your own domestic telly will do very well) and a *cassette recorder*. It really IS that simple.

10 THINGS YOU CAN DO WITH COMPUTERS

Play games

The most popular use of computers in the home. Games Software tapes outsell all other programs. Computer games vary from 'Space Invader' type arcade games to simulations of strategy, detective and adventure games, battle games and race games. Really, the list is endless and before buying your micro, check on the software available. Computer games are good for you. But beware—some of them can be very addictive!

Education

Packages are available to teach you Computer Programming, Physics, Chemistry, a foreign language or to help you brush up on your English grammar.

Find out more about yourself

Other programs test your IQ, personality, powers of deduction or even your general knowledge. Some of the results can be worrying but you can always cheat!

Help you make decisions

You can buy Software to assist you with tax returns, HP calculations, mortgages and loans. Financial and project planning can be very useful to help you to make decisions (e.g. Do I take out a second mortgage at 11% against a security of so much and an insurance scheme of such and such?). However, once you have made the decision, your bank will keep track of what is going on rather more efficiently than your micro. Home computers are not used very often for keeping personal money matters in order since you have to enter in all details of your receipts and payments.

Song and Dance

Some computers will play music for you but others are tone deaf. Some computers will draw fancy pictures or design a new colour scheme for the garden. Others will only move a few dots of light around the screen. Pretty boring. It's all a lot like us humans... some of us are good at drawing, music and arty things while others are not. Computers are not very good at dancing because they get their wires all twisted up and, until the new generation of robot peripherals comes along, completely incapable of doing the laundry. Sorry, but there it is.

Specialist programs

You can buy Software packages which give you instant recipes in the kitchen, calculate your car's performance or keep a running diary and address book locked into your micro. Some of them are useful but many others are not. When in doubt, ask yourself if the same job couldn't be done quicker and more effectively using pen and paper.

Word-processing and mailing lists

Using your micro as an advanced typing machine will require a printer and also perhaps a floppy disk memory system. Word-processing is a very wonderful thing but you will have to spend at least £1,000 on further Software and Hardware. If that's what you want to do, make sure your micro has a decent typewriter keyboard.

Control your central heating and turn on the garage lights

No, it won't. Or rather it will if you are prepared to work out what sort of peripheral equipment you will need. Why bother? A light switch turns on lights pretty well and a cheap programmer unit for your boiler is far cheaper than a micro system at regulating your central heating.

Teach you about computing

It'll certainly do that and that's probably the most useful thing to learn. Even if you learn that computing is not the thing for you, that's still something!

Keep a record of all your books, disks or wine bottles

Yes, it can do that for you but you will need extra memory on floppy disk. Cassettes are too slow for immediate access to information. If you are going to keep a reference data file, remember you will have to type all the information into the computer to begin with. Not an attractive thought if you have a gramophone record collection numbering several hundred! On the other hand, over a hundred bottles of wine is an easier task. You just drink a few dozen before you start!

10 THINGS TO BEAR IN MIND WHEN READING COMPUTER ADS

Screaming headlines

The object of any advertisement is to get you to buy the product.

...Years of Experience in Computers...

There are more and more new companies springing up every day. 'Years of Experience' may therefore only mean just that... two years! There's nothing wrong with investing in a product from a young company but remember that—not only do more and more companies join the computer race—more and more companies may eventually go bust! If your computer firm folds up you will probably be left with a redundant micro since no Software or add-ons will become available.

256 million megabytes of RAM

Of course, more memory can be useful but don't be browbeaten into believing that it'll solve all your problems. Many computers carry clarion-call adverts telling you how many thousands of bytes of RAM their machine is capable of giving you, but not all of it will be usable to you. Read between the lines to see how much memory is available when programming in BASIC. See further on in this book for more information about computer memories.

Available now from all computer shops...

Don't you believe it! Shops tend to concentrate on particular brands of computer. And there are some computers which are almost impossible to find anywhere! Check that there isn't a long waiting list for your chosen micro. There may even have been unforeseen problems in the final production model and the machine has already been temporarily withdrawn!

Bi-Directional Asynchronous Gobbledygook...

Computing is a new industry and—from the Scientific point of view—a remarkably complex one. Adverts will quite possibly use technological gibberish to blind and confuse you.

Free user manual and accessories...

Of course it comes complete with all that! All micros should at the very least tell you how to work the thing...

New low price...

It is common knowledge that the actual manufacturing costs of a modern micro are proverbial peanuts. Most of the company profits (if the firm has any!) are channelled into development costs. In the future, costs of Hardware are bound to fall while Software costs (which are more labour intensive) will not. Manufacturers can afford to drop their Hardware prices still further but whether they will or not is another matter!

Equally at home in the office or in the sitting room...

This statement needs to be treated with caution. The Business micro market's requirements are essentially different to the home user's. In the office, computers are used to handle a variety of tasks which tend by their very nature to be specialist. A home micro should be much more of a 'jack-of-all-trades' since the whole point of the operation is you won't necessarily know what to do with it until you've played around with it at home. Your home micro MAY be able to help you out with some of your business computations but it probably won't be compatible with your existing office equipment.

This machine will do everything for you...

No, it won't. No single machine can be best at every different application.

Pages and pages of the same advert...

In view of what I've already said about cut-throat competition and rival systems in the computer world, if you're stuck for a decision then stay in the popular stakes. A computer firm that has invested in lots and lots of money to spend on advertising and publicity is—hopefully—less liable to go bankrupt tomorrow. There are of course some disturbing exceptions to this rule but the basis behind it is sensible enough. It is to your ultimate advantage to see your chosen brand of micro become a leading popular make. Only then will a full range of Software and add-on equipment become available at the right price.

10 THINGS ABOUT THE WAY COMPUTERS WORK

How does a computer work?

Heavens above, you really want to know? Well, I mentioned at the beginning that a computer is a very fast electronic counting machine. The processor—that's the important central 'thinking' bit—performs thousands of calculations in a split second. It not only adds up things, it can also store data and use these sub-calculations later on in the program if required. It can even alter the program instructions at any time if the program orders the processor to do so. Although computers are very simple adding machines, they operate very fast which enables them to undertake relatively complex calculations.

How does a computer count?

In a pretty idiotic fashion. Computers can only understand a very simple language... 0 or 1. '0' is computerese for 'OFF' and '1' is 'ON'. That is one BIT. A BIT is the smallest part of any calculation and by itself, a BIT is a bit useless. You can't do much with something in a machine that is either off or on and nothing else. To make computers useful, groups of BITs are placed together to be able to handle more complex numbers than simply 0 and 1. A more common way of reading computer BITs is to join eight BITs together. This is one BYTE. (If you think about it, someone involved in the early days of computers must have had a sense of humour... 8 BITs equalling 1 BYTE? Oh, well...) Your computer is chock full of BITs and BYTEs... BITs to perform this and that type of function, or store this number here or there or even tell you something has gone wrong somewhere. It's all very clever. A proportion of your micro's memory is given over to these sorts of functions. It's the operating part of the processor without which nothing would ever take place. The remaining BYTES are given over to user memory—that's YOU—and they are available to you to store whatever sort of data (numbers, letters, calculations or pretty graphic symbols) you care to put in your computer. When calculating how much memory you need, a good guide-line is to imagine a single character (a letter, a number or symbol) as equal to a single BYTE. So, to store the sentence 'I Love Computers' in your computer's memory will occupy 16 BYTES of RAM (a space between words will also use up a BYTE).

What do RAM and ROM mean?

RAM stands for Random Access Memory. This is the part of the computer normally given over to you for your use. We talk about how many BYTES of RAM there are available in the expression '... so many K of RAM'. One 'K' is one thousand, so a 32K RAM computer has 32,000 BYTES of RAM. You can store data in RAM or take it out and do anything you like to it.

ROM is different. It stands for Read Only Memory and cannot be altered by the user. It normally holds the operating system of your micro and is therefore instantly available to you whenever you switch on your computer. So perhaps you can see now why so many 'K' of RAM is a bit misleading as a selling point. Yes, more RAM will of course be useful to store your own programs, but the ease with which you can program your micro resides in its operating system (the ROM part). The more comprehensive the ROM, the easier it is for you to do things with your computer.

What do I need to know about all the BITs inside?

Nothing very much if you don't want to. Part of the operating system of any micro already contains a computer language to enable you to talk to the machine. That means you can type real words or codes into the computer and the machine's operating system will translate your instructions into a language of '0's and '1's that it will understand. There are many different computer languages—mostly with strange names like ALGOL or COBOL or FORTRAN—but the one most commonly used in home-micros is BASIC. The rudiments of the BASIC language can be picked up in an hour or two and you can be writing useful BASIC programs by the end of the week.

Are there lots of different types of BASIC and what else can I use on my micro?

There *are* different types of BASIC but the main commands are the same in all of them. Your instruction manual will show you what to do (with luck) and several specialist programming tutorials have been published so

don't worry. Later on, when you have mastered BASIC, you can learn to program your computer in ASSEMBLY LANGUAGE. This is faster than BASIC in operation because you will then be communicating directly with the machine's operating system instead of waiting for the machine to translate your BASIC commands. Hence the other—and more widely used—term for this language: MACHINE CODE. But BASIC is what you will start with and it will serve you well enough.

What exactly is a silicon chip and does my computer have one?

Your computer has several chips inside it. 'CHIP' is a common name for an INTEGRATED CIRCUIT. This means that all the circuitry is formed on a single piece of semi-conductor material, instead of all the various components—transistors, diodes and resistors—being joined together by bits of wire or strips of metal.

A chip is an incredible piece of miniaturisation... everything is crammed together in sections which are only a fraction of a millimetre in depth. Then all the sections are connected up and packed together to form a biscuit-like wafer. On a single chip about one inch long and half an inch wide there can be thousands of BYTES. It is all very wonderful but if a chip goes wrong there is practically nothing anyone can do to mend it. You just throw it away and put in another. That's progress.

Why is a micro computer called that and what is a mini-computer?

Traditionally there are three types of computer:

Mainframe: the central processing unit of a very large computer which many people can access at the same time, possibly in different locations.

Minicomputer: the 'in-between' size of computers. Because they are not as large as mainframes or as portable as micros, they tend to be used to run things like the accounts department of a fairly large company.

Micro-computer: the name 'micro' derives from the fact that the central processor is contained on a single microchip. They are—of course—the smallest type of computer.

What is meant by the term 'USER FRIENDLY'?

If the computer has a relatively simple operating language such as BASIC, it is called 'User Friendly'. This does not mean that the micro will kiss your feet or giggle at your jokes. It simply means it is easier to operate than other machines because it uses words taken from the everyday language used by you and me like 'READY' or 'HELLO' or 'ERROR' instead of cryptic expressions such as 'XAX2 B2 C1' which make about as much sense as a ploughman's lunch to a visiting Martian.

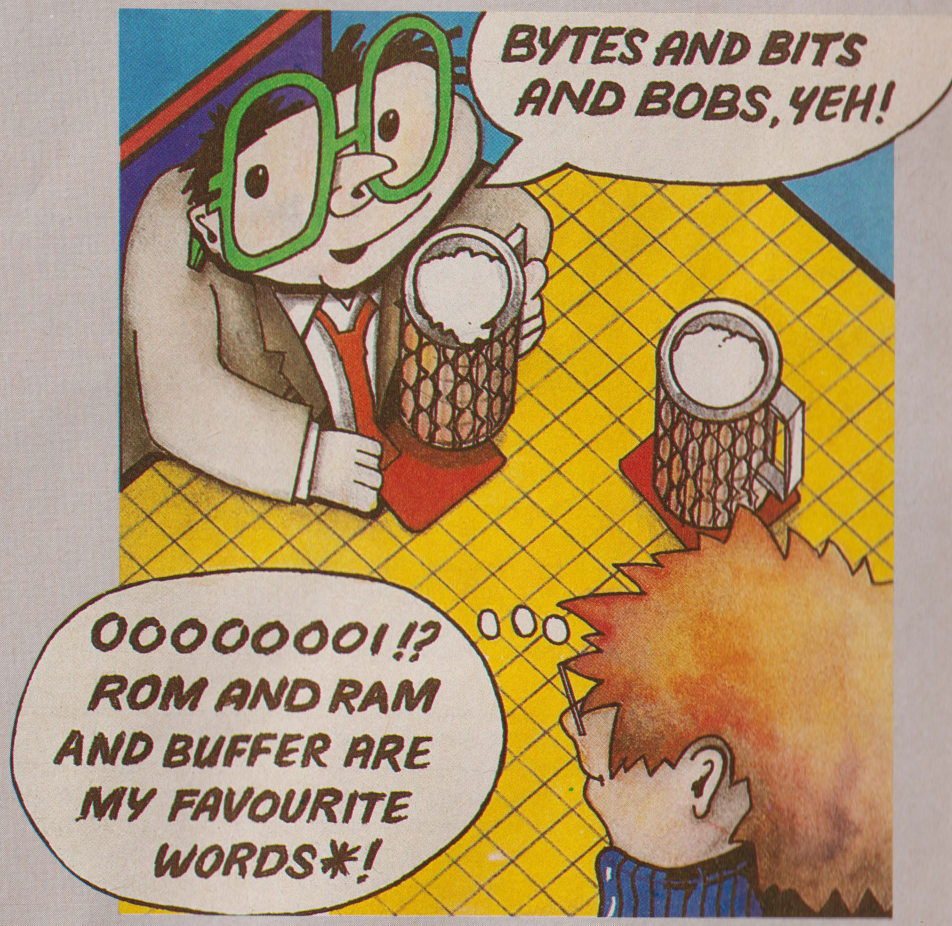
Does a micro generate heat?

Yes, it does—some more than others. Wouldn't you generate heat if you were forced to flash pieces of information around inside your glowing chips at the speed of light? Some micros can be uncomfortable on the knee after an hour or two, but you can always use them to keep warm on a cold day.

But how does a micro REALLY work?

I've already told you. But if you want to know more, then there are lots of books in your local library. Computer Science is a fascinating subject and you may become quite hooked by the idea and wish to discover more about it. I can't go into the innermost workings in this little manual, however. I must move rapidly on to try and explain some of the things that computer people talk about. (Not all of them understand what they are saying, but it can be quite useful to 'show off'.)

10 WORDS TO IMPRESS YOUR FRIENDS WITH AT PARTIES



ADA

The Countess of Lovelace wrote the first computer manual, the U.S.A. Department of Defence have honoured her by naming a new programming language after her. Friend and mentor of:

BABBAGE (Charles)

'Babbage' is not so much a jargon word as a measure of your knowledge of computers. Babbage (1791-1871) was an English mathematician who designed the world's first programmable computer. The use of his name in conversation, linked skillfully to that of Ada, will cause computer wizz-kids to turn your way. He was a very clever man, but because Victorian engineering was not up to the job, his design could never be properly 'de-bugged' in his lifetime.

BAUD (Pronounced 'Bored')

This is the speed at which computers pass information along a wire or over a phone line to other computers or peripheral devices. One BAUD stands for one BIT per second. Different devices can accept information at widely differing speeds. For example, your cassette recorder may load a computer program at around 300 BAUD which is somewhat slow because magnetic tape is a relatively inefficient way of relaying computer information. Sending a program over a telephone line can be much quicker—say around 1200 BAUD, while some advanced satellite communications transmit information at speeds in excess of 5 million BAUD. I'm not sure if you really wanted to know about BAUD, but it's a useful word to name-drop at parties. Your friends will be extremely impressed.

BUG

A mistake in your program. Hence the phrase: 'I'm de-bugging the program' when you're sitting up late at night trying to get all your computing errors sorted out. This can be a somewhat exhausting business if you've got yourself in a right old muddle. It helps to lay on cups of black coffee and cheese and biscuits to keep your powers of logic alive and alert. (NB. Alcohol does NOT help in 'de-bugging'!)

BOMB or CRASH

Your computer may BOMB/CRASH or—here's another—HANG UP if you've got a serious BUG in the program. That means it will simply stop working until you re-start it again. A particularly serious type of CRASH occurs when you suddenly lose all your data. This event is usually accompanied by a few well chosen expletives since you will then have to type the entire wretched program in from the beginning.

GARBAGE

Pretty self explanatory this one. When something goes wrong and a computer HANGS UP, you will often get GARBAGE printed out onto the screen or onto a paper printer. GARBAGE is meaningless data. It is the nearest equivalent to a computer having a brainstorm. Not a pretty sight.

SYNTAX

Now we all know what SYNTAX means, don't we? It means Grammar. English grammar follows certain rules and other languages need to be grammatically correct. So too does the language you communicate to the computer. If you've made an error in the way you have written a particular instruction in a program, computer people would refer to that as an error of SYNTAX. (You don't make *mistakes* in computing. There are lots of words for making muck-ups such as BUGS, CRASHES or SYNTAX ERRORS but only machines with 'BBC BASIC' scold you with the response 'MISTAKE'.

SYSTEM

It is not done to refer to your machine as a 'computer'. It sounds far more impressive if you encapsulate all the Hardware, peripherals and Software under the umbrella title 'SYSTEM'. The phrase: 'My SYSTEM is up and running' sounds much better than: 'I've got a computer and it works'.

USER

That's computerese for *you*. Computer people don't often talk about human beings. They prefer to use the word USER. Hence such expressions as:
USER FRIENDLY
USER GROUP: a club where humans can actually TALK to each other in real English.
USER PORT: a hole in the side of your micro that can be used for any peripheral device you (the USER) may wish to add on.
USER ANALYSIS: a survey of why people use computers. (Don't laugh!)
USER-ORIENTED: a SYSTEM that is set up with computer novices in mind... And so on. You could even invent your own uses for USER. How about USER INPUT for sausages and chips? or USER BOMB for going to sleep? Oh well, just a thought...

WORD PROCESSOR

You will probably have got the hang of all this jargon by now. A WORD PROCESSOR is a computer dedicated to the specific task of handling characters and text. You can buy word processor software packages for your micro but the quality of your finished typewritten work will depend on the quality (and therefore the price of your printer.

Programming Languages

What are they, what's the difference between them?
Programming a computer to perform a particular task consists first of breaking down that task into smaller and still smaller operations, and then expressing those operations in a form which the computer can understand. What you end up with is nothing more than a long list of instructions written in a computer code called a programming language.

Many newcomers to computing experience difficulty with the idea of computer programming languages, and frequently ask: why can't computers be programmed in English? There are three reasons. First, because extracting the meaning from a piece of English text is a very difficult task for a computer, not least because we do not yet really understand how the brain does it. Secondly, English is a very ambiguous language, and a computer has to have clear and unambiguous instructions. Thirdly, English is inefficient: most tasks would require an awful lot of words to define exactly how they are performed. The reason we aren't aware of this is that most of the time when we give instructions to another person, the bulk of the task will consist of operations with which they are already very familiar. If we had to explain every minute detail, it would be utterly impracticable. A computer is just like a person who has no previous experience of the tasks you are instructing it on.

There are many different 'dialects' of programming languages, but broadly speaking they can be divided into two classes: 'low-level' and 'high-level' languages. At the heart of any home computer is the central processing unit (CPU), which can perform only very simple functions such as adding two digits together, or moving data from one part of memory to another. A low-level programming language is one that matches very closely with the instructions understood by the CPU. As a consequence, a program written in a low-level language (sometimes referred to as

'machine code') will operate very fast. However, writing that program will be very hard work, because every task must be built up from the most elementary tools.

By contrast, a program written in a high-level language (of which the most widespread example is BASIC) will be much easier to write, but won't operate so quickly. The higher the level of the language, the closer the final list of instructions will resemble English.

However, the catch is that some means is needed to translate the program written in the high-level language into a form that the CPU can understand. There are two methods of achieving this: an interpreter or a compiler, of which the former is more common in home computers.

An interpreter is itself a program that usually resides in ROM, permanently inside the computer. When you RUN a programme, the interpreter works through it line by line, interpreting each statement into the low-level instructions needed by the CPU. An interpreter is said to be a 'transparent' piece of software, because you don't see it doing anything. To the person using the computer, it simply appears as though the CPU is executing the BASIC program directly.

All this translation takes time, however, so the more expensive microcomputers with built-in disk drives offer the alternative of a compiler. Once you have written your program in its final form (this is called the 'source code') the compiler is called up. The compiler produces a separate copy of your program, but translated entirely into machine code. Thereafter, this new version of your program (called the object code) is the one that you load and run.

Let's summarise the advantages that a high-level language offers over a low-level one:

- It looks after the 'housekeeping' for you, meaning that instead of having to remember exactly where everything is kept in memory, you can simply refer to types of information by name, such as PRICE, DATE and TEMPERATURE.
- It offers more sophisticated functions. Instead of having to perform everything using addition and subtraction, a high-level language will offer multiplication, division and trigonometric functions at the very least.
- It's easier to read and understand the final code, and that means that you, or someone else, can more easily make modifications to the program at a later date.

- The structure of the final list of instructions more closely resembles the structure of the problem being solved.

As we've already stated, BASIC is by far the most common high-level language and indeed comes as standard on most home computers. However, we'll round off with a quick look at some of the alternative languages available for these machines.

BASIC

The Beginner's All-purpose Symbolic Instruction Code (yes, they probably did think of the acronym before working out what it stood for) was primarily designed in the 1960's as a teaching aid, and is now considered to be outdated by many experts. Its lack of 'structured commands' (see Pascal) means that it doesn't really encourage good programming discipline. However, it is simple to use even for a beginner, and its incorporation into most home computers means that it is by far the most popular language still. Like the QWERTY layout for keyboards, there are far more elegant and efficient solutions, but BASIC is so well-established that it will continue to remain popular.

Pascal

Named after the 17th century mathematician Blaise Pascal, in recognition of his contribution to the development of mechanical computing machines, Pascal is a far more sophisticated and efficient language than BASIC, and has become increasingly popular for writing large programs such as business applications. Its chief virtue is that it is a structured language—the final structure of the code reflects the logical structure of the problem. Pascal encourages 'top-down' or 'structured' programming—breaking down the problem into smaller tasks and then applying the same process to each of those sub-tasks. Pascal is actually a cross between a compiled and an interpreted language.

COMAL

The Common Algorithmic Language was devised as a teaching language with the simplicity of BASIC, but the structured capability of Pascal. It is popular amongst schools, and in Denmark, where it was invented, all computers used in schools have to be able to run COMAL. However, some of the newest versions of BASIC (such as the one on the BBC micro) resemble COMAL so closely that it is doubtful whether the latter will gain much more ground in this country.

LOGO

More than simply a programming language, LOGO is really a philosophy of education, and a family of computer languages to implement that philosophy. Invented by Prof. Seymour Papert, but based on the philosophy of the eminent Swiss child psychologist Jean Piaget, LOGO is designed to create a learning environment on a computer, in which children can learn mathematics and other subjects in the same natural way in which they learn to walk and talk. Like FORTH, it starts out with a number of simple command words, which are built up into more sophisticated ones. In this way, children learn how new ideas can be understood by breaking them down into simpler ones that they already understand.

One of the most striking features of LOGO is Turtle Graphics—with which young children can learn about spacial relationships and elementary geometry. The Turtle is a small two wheeled robot device that moves around the floor under instruction from the computer. With a pen mounted at its centre, the Turtle can be made to draw objects under the direction of the child.

The microcomputer in business

There can be little doubt, now, that the invention and widespread usage of the microcomputer will cause nothing less than a revolution in the way we work and the way we spend our leisure time. So far in this booklet, we've been concentrating on microcomputers in the home. Now we're going to look briefly at applications for the microcomputer in business.

The first computers were all developed for scientific or mathematical applications, such as the machines used for code-cracking in the Second World War. All through the 1950s and '60s, however, most of the development work on computers concentrated on commercial applications. The difference between the two, incidentally, is that scientific applications perform complex calculations on a limited amount of input data, whereas commercial applications really only make use of simple arithmetic, but have to store and process large numbers of transactions.

While the mainframe (costing upwards of £100,000) was the only form of computer in existence, it was effectively available only to a very limited number of companies, and to governmental bodies. The mini-computer, developed in the '60s and '70s brought the 'entry fee' down to around £20,000 and also saw the birth of computer bureaus who sold time on the computer to smaller companies still. However, the cost involved, the technical limitations and the need for the computer to be operated by a specialist data processing staff meant that the range of commercial applications was strictly limited. Almost all, in fact, revolved around the accounts department: payroll, stock control and the various ledgers, for example.

The invention of the microcomputer in 1977 was what triggered the revolution. The main difference between a microcomputer (also called a 'personal' or desktop computer) and a minicomputer is not primarily cost or specification, but application. The low-cost and user-

friendliness (you could just plug it into a mains socket and start operating it) of the micro, meant that anyone could buy, install, and start using one without any previous computing knowledge.

As a consequence, a whole generation of users, untrammelled by the thinking of DP departments, began to apply the microcomputer to the tasks they needed. The result is a whole catalogue of imaginative business applications for micros. We'll be looking at the most popular ones shortly, but a glance through the advertisements in a personal computer magazine will confirm this description.

The first personal computers were used equally for home, educational, scientific and business purposes. The latter required both some form of hard-copy or printed output for the production and permanent recording of all transactions, and some form of mass-storage device, since a typical business application will require access to more information than could be held in the computer's RAM at any one time, and a cassette recorder is neither a fast or reliable enough medium. So peripherals in the form of printers and floppy disk drives were made available for most machines.

Nowadays, microcomputers are generally designed primarily either for home or for business usage. The former will be designed down to a price, with colour graphic and sound facilities. The latter will probably feature built-in disk drives and much more RAM memory. A business microcomputer will probably also have had more effort put into the 'ergonomics' of its design, with a detachable keyboard designed for a touch-typist and an adjustable anti-glare screen to reduce operator fatigue.

However, when buying a microcomputer for business use, the software is really far more important than the hardware, so we'll now take a look at the most popular types of package.

Accounts

This is perhaps the least exciting and original application for microcomputers but is an area where the microcomputer can pay for itself very quickly in terms of improved cash flow, credit control etc. All the standard books of account can be computerised in this way: sales ledger, purchase

ledger, nominal ledger, payroll, stock control, invoicing etc. Where a set of such programs are integrated, it means that values will automatically be posted from say the sales ledger into the nominal ledger. Some packages allow a wide variety of analyses to be made of the month's transactions, too.

Word processing

Really a fancy name for computerised typing, a word processing package allows you to create a document by typing it into the computer, save it onto disk, edit or alter the text in any way and then print out the final version. For lengthy documents, the benefits include time saving, less errors and a better presented result with automatically centred headings and page numbering perhaps. A WP also permits letters to be 'personalised' and then printed in bulk. Because it directly replaces a manual system and can result in a very rapid increase in productivity, word processing is often chosen as a first application, with others added later.

Financial planning

Packages for this application are often called 'spreadsheets' because they mimic the large sheets of ruled paper used for budgetting and forecasting, on the screen of the microcomputer. The user types headings and figures into the various columns and rows, and then specifies the relationship between the elements of data—such as the 'total' at the bottom of each column. As a result, if any value on the spreadsheet is changed (for example if the bank base rate fluctuates) any other figure that in some way depends on it will change automatically—without recourse to a rubber, pencil and calculator. This simplicity encourages the user to test out his forecast against a range of possible eventualities, and has given the programs the nickname of 'what...if' calculators.

Database

The analogy for database on a microcomputer is an electronic card index or filing cabinet. The user defines a typical 'record layout' and then fills in the 'blank cards' on the screen to form a 'file' of information such as a personnel file or product catalogue. The main advantage of a database over its manual counterpart is when it comes to

retrieving that data. Requests such as 'Print the addresses of all male customers in the Birmingham area, over the age of 30 who drive Ford cars' would be a simple exercise for the computer, and back-breaking for a human counterpart.

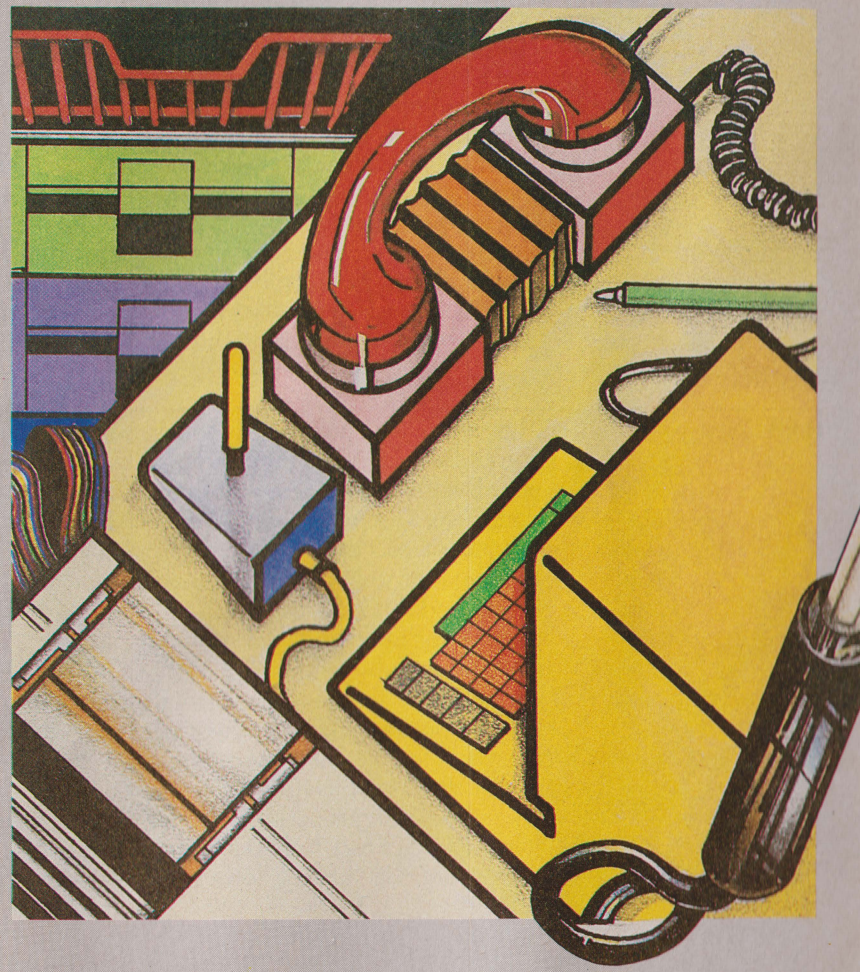
Electronic mail

Really a fairly recent application, because it depends on services such as British Telecom's Telecom Gold. By using a device called a modem to link your computer with a telephone line, it is possible to transmit a document or message to any other computer that is similarly equipped. The process is not only instantaneous, but the telephone charges can work out cheaper per letter than a second class stamp.

Specialist applications

The above list is by no means exhaustive, and there are many applications dedicated to a particular line of business, from sportswear retailing to the construction industry. As with home computing, the limit on the applications of business microcomputers is really only people's imagination.

10 THINGS TO THINK ABOUT ADDING ONTO YOUR MICRO



The same language...

As you will have gathered by now, the spirit of commercial rivalry has led to incompatibility. Different types of computer work at differing speeds and have incompatible electrical connections. Software for one machine will probably not work on another and peripherals made by one computer company will not work on a rival computer.

Peripherals CAN be made to function perfectly well with just about any computer however, providing you can obtain the right INTERFACE. An INTERFACE is the Hardware circuitry and Software backup required to make your add-ons work with your computer. All the peripherals in this section—printers, floppy disks and what have you—are available for separate computers but you must first check what sort of Interface will suit your machine. If in any doubt, ask your dealer whether machine such and such will work with printer so and so. He should know. If he doesn't, then phone the manufacturer. Most firms have helpful individuals hidden deep in their technical departments who can help if you can get your phone call put through to them.

Hard Copy

The most useful peripheral you can add to your computer is a printer. Printers come in all shapes and sizes but they will all give you a Hard Copy on paper of data, results, correspondence or even listings of the program itself. Here are a few examples:

Electrostatic—Normally the cheapest type of printer. The main—and serious—disadvantage is it requires special paper. Most others can take ordinary paper.

Dot matrix—Anything from £150 to £500 would be enough for a dot matrix printer. It works by punching tiny needles onto an inked ribbon. It is fast but can be rather noisy and the overall effect on the page is of a series of miniscule dots which go to make up each letter or character. Your gas bill probably arrives with a dot matrix printer. It is not recommended for letter quality correspondence but will serve you well in every other respect.

Daisy Wheel—From £800 to £1,600. This is slower than a dot matrix but is better quality on the page. It is also considerably more expensive than a matrix printer, but if you are going to use your micro for high quality word processing then you will probably need a Daisy Wheel printer.

Ink Jet—This will cost you even more money, say £2,000 or more, and the result is certainly no better than a Daisy Wheel printer. The advantage, however, is speed—an ink jet printer can print something in the region of 250 characters per second.

Laser—About £10,000. Actually, I can't think why you should want anything as fast or expensive as a Laser Printer unless you intend to go into the mail-order business!

There are other printer possibilities such as converted electric typewriters or adapted golf-ball machines. Providing you have the right Interface there should be no problem but remember that any machine which has been converted is being asked to perform a task other than that for which it was originally designed. In all walks of life, a technical 'lash-up' is never as satisfactory as a purpose designed system.

Floppy Disk

If your first buy is a home micro, you will be loading and saving programs on a cassette recorder. This works perfectly well but it is rather slow, sometimes unreliable and difficult to obtain particular items recorded in the middle of the tape. Floppy disks are a far better way to store and retrieve information. Loading and saving from a disk will take only a few seconds and you can fit more data on one disk than you can on a box full of cassettes. Of course, it will cost you more money... say anything from £200 to £800 depending on the size and type of disk. However, it is well recommended as a cure for all those 'TAPE LOAD ERRORS'. There are three sizes of floppy disk... 3½ inch, 5¼ inch and 8 inch but most small micros use the 5¼ inch disk as standard. They can be single sided or double sided (more memory stored). They are called *floppy* disks because they are flexible. Treat them with care and do NOT flop them. A bent or warped disk will not be able to read back data.

There are also HARD DISKS on the market—commonly known as WINCHESTERS. These may well become the mass memory storage units of the future. Hard Disks can store much more data than floppy ones but Hard Disk units are more expensive. It *IS* confusing since there are so many different things to choose from. If in doubt, go for a 5¼ inch floppy disk unit. There are so many of them about that they are hardly likely to be redundant tomorrow.

As with printers, make sure you have the correct Interface between computer and disk drive.

Light Pen

This looks—as the name describes—exactly like a thick pen with a wire attached to your computer. If you hold the pen close to your display screen, the pen 'picks up' the information directly from the screen. It is useful in some applications where its ability to move characters and graphic symbols around the display is a lot easier than having to keep referring to your typewriter keyboard. Not all micros may be able to fully utilise a light pen's capabilities. Cost? Anywhere from £30 to £100, but try one out first to see if you really need one.

Game paddles and joysticks

These may or may not be supplied as standard when you buy a home-micro. If not, you should be able to find a set with the right Interface and connections for most makes of computer. They vary in price from £5 to £50 depending on quality but they all will perform the same task. Joysticks and paddles are used extensively in arcade games where you can steer your spaceship around the sky or zap Klingons with uncanny accuracy simply by moving the joystick control round and round. Some arcade games Software will ONLY work with joysticks.

Mouse

Mice are the new 'in thing' for micro-computers. You might think that a mouse is a little furry rodent with a long tail but—in this case—you would be wrong. Like the 'Light Pen', use of a mouse with a computer will require extensive Software and not every micro will be able to be 'mouse-connected'. What is it? Well, again like the 'Light Pen', it's a device for moving things around your TV screen or even inputing instructions to your computer without using the typewriter keyboard. The mouse is a little box on wheels or a roller-ball which is attached to your micro by a long wire. It is very easy to use since you simply roll the box around a flat surface such as your desks or table which in turn moves a pointer or other object on the screen.

Computer speech and music

Many micros have excellent 'on-board' music and noise making capabilities and most will relay sound through your television set's loudspeaker or a small inbuilt speaker on the computer itself. If you want to add to the vocal powers of your micro, you could invest in one of the many devices now on the market. You could spend anything from £35 to £1,000 on a box of tricks that will give you a laughable attempt at a symphony orchestra. It is cheaper to buy a mini-music-synthesiser and—perhaps—more fun. If you really want to do serious studies of computer music, then make sure you buy a computer at the outset which will handle your musical requirements rather than add little boxes onto it later. A 'lash-up' will never function as well as a computer dedicated to a particular use.

Speech boxes can be rather more fun. As with music, if you are going to be *serious* about it all (perhaps you're engaged on a study of vocal phonetics?), then you will need a dedicated computer specialising in voice patterns. Since the chances are you simply want to have a bit of fun with computer voices, you can purchase a cheap artificial speech unit and try and make your computer talk sense. A word of warning, many devices such as these may be very demanding of computer memory. You may—after an evening's work—shout 'Eureka' at having finally programmed your micro to say 'Good evening. How are you?', but you may have used up so much memory that your computer can do nothing more with itself.

Video Monitor

As I've already explained, most home micros will function perfectly well with your domestic TV set. If you want to buy a separate telly for your computer, then you might

consider buying a computer colour video monitor. The picture from your computer will be considerably improved but you will NOT be able to receive TV broadcasts upon it. Cost? Roughly the same as a colour TV portable—£150-£250. Business applications which demand up to 80 characters of text across a screen demand the higher resolution of a video monitor.

Modems and couplers

These devices will make your micro communicate with the outside world. You might not want it to do any such thing; goodness knows what it might get up to when you're not looking! Science fiction and horror movies apart, the ability to link your computer up to central data banks, local shopping centres or other home-micros is with us right now.

The difference between the two peripherals? Well, a MODEM converts the electric signals into burps and beeps which can travel over ordinary telephone lines. The ACOUSTIC COUPLER is a cheaper and more portable device which fulfils exactly the same function but at a slower speed. In appearance it boasts two rubber cups which are moulded to accept a normal telephone hand set. Remember the micro-system in the film WAR GAMES?

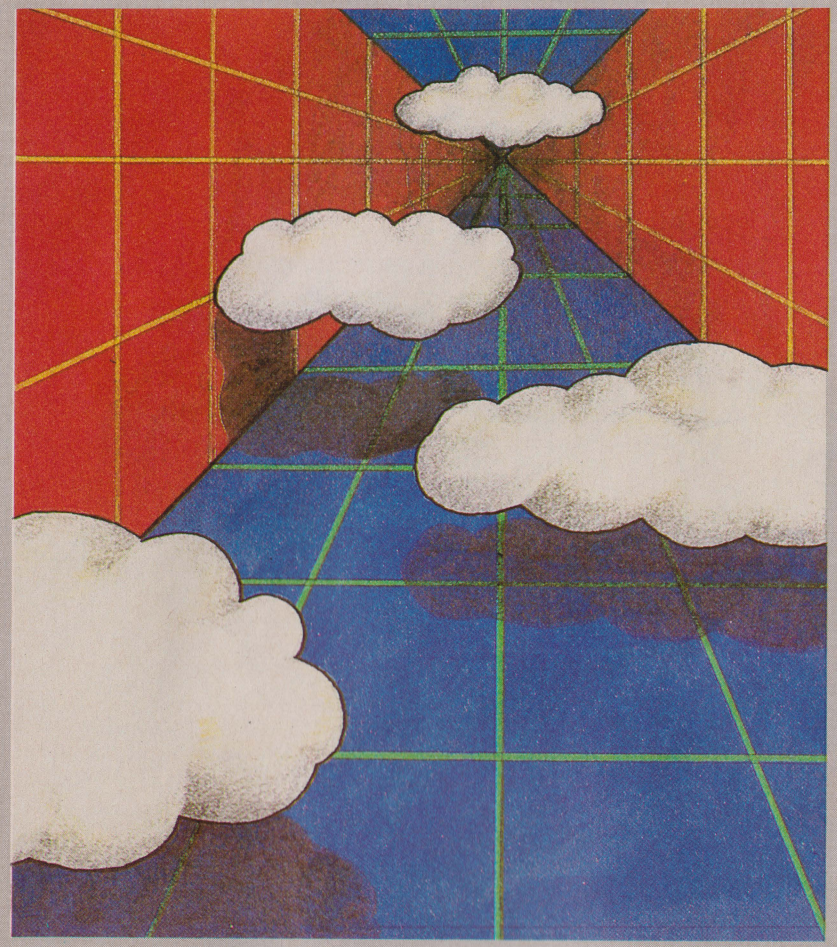
And many more!

I'm going to lump all these things under one heading. Some of them are not true 'peripherals' since they are added to the *inside* of your computer to improve its performance in one way or another.

- You can add extra memory to most computers... either extra RAM chips to plug into empty sockets inside or exterior RAM packs to expand your computing power.
- You can buy extra chips or cartridges to add to your computer's operating abilities. These might include computer languages other than BASIC, sophisticated graphics packages or high speed assembly routines.
- Some micro-computers are not readily usable for business purposes because they possess a non-standard keyboard. You can find 'add-on' keyboards for several of these micros which will make any professional typist feel at home.

- Individual micros have particular peripherals. For example, you can buy the 'Micro-drive' for Sinclair machines which is much faster than a cassette unit.
- You can buy banks of mains relays (which really WILL turn your lights at home on and off or run the central heating if that's what you want), plotter-printers which will sketch out computer artwork, multi-user network boxes to join lots of micros together or robotic interfaces to move mechanical arms and legs all over the place.

10 THINGS WHICH COULD HAPPEN IN THE FUTURE . . .



'Computers and computing will become totally defunct by the year 2000 as a new and as yet unthought of method of data manipulation takes over.'

PROBABILITY RATING: Unlikely. Current Computers may well become obsolete but the Science of computing can only continue to grow. Whatever you may learn now in '1980's technology' will stand you in good stead for the future.

'Computers will take over the World and Prime Ministers and Presidents will be replaced by machines.'

PROBABILITY RATING: Ridiculous. Come on, come on, you've been reading too many scary books. The best pieces of Hardware designed to look after people are other human beings. If things ever start to get really bad—'Computer in Election Broadcast Shock'—then we will only have ourselves to blame. Machines will only do what we humans program them to do. So there.

'Computers are wonderful and amazing and incredible and fantastic and they will make my life SO easy and solve ALL my problems.'

COMMENT: Most of that is a load of rubbish. Yes, they are very clever inventions and lots of computer converts get VERY excited about the whole idea of computers. But they will never solve all your problems. Neither will your dishwasher, vacuum cleaner or office dictation machine—all of which are useful inventions in their own right.

'Computers will appear in every home and in every office. Unemployment will continue to rise as more and more firms go over to computerised automation.'

PROBABILITY RATING: Quite likely. Certainly, there will be more and more computers in every walk of life but whether they alone will be responsible for Global unemployment is a different question. It is more likely that the pattern of employment itself will change as society adapts to increased leisure time. On the negative side, one has to admit that the use of computers can certainly contribute to a rise in unemployment. On the positive side, remember that there are many tedious jobs that humans would be quite glad to give up to computers. Also, there are many new jobs that the second industrial revolution will bring in its wake.

'Computers will be able to check up on people. We will all be on a 'file' somewhere or other!'

PROBABILITY RATING: Yes, definitely! It's actually happening NOW. If that worries you, then make sure you can check that the information is put to the correct use. Don't blame the computers . . . they just do what they're told!

'Computers will get smaller and smaller until the entire contents of the Bible will fit into something the size of a sugar-cube.'

PROBABILITY RATING: Absolutely certain. The two developments to look out for are new techniques in miniature data memory storage and continuing progress along the lines of the pocket sized flat screen television.

'I will get very rich from writing my own Software programs and selling them to others.'

PROBABILITY RATING! Who knows? You may make a lot of money but it'll have to be a truly original idea. The days when you could make a small fortune from a 'Space Invaders' look-alike program are long gone. If you come up with a good game (or other piece of Software), then either take it to a reputable Software publisher who won't rip you off or—and this is a *last* resort—enter the Software mail order business yourself. Be warned. More and more independent Software businesses are going bust. Don't jump into anything before you have really thought out your market research.

'I will get bored with the whole subject after a week or two and never wish to SEE a computer ever again.'

PROBABILITY RATING: On the whole, unlikely. However, if that should happen to you, then you will definitely have learnt that computers are not your scene.

'When I become a computer expert, my friends will gasp at me in admiration, employers will bow down before me and girl/boy friends will rush after me in droves.'

COMMENT: This statement has nothing to do with computers. Once you are a computer expert you will be better equipped to understand modern technology but you will still be the same charming/boring/brilliant/stupid/loveable/clever individual you are at present.

'Computers are dangerous. They will bring about World War Three and the End of Civilisation as we know it...'

PROBABILITY RATING: Zero. Or nearly Zero.
COMMENT: As I've remarked before, it would be technically possible to do just about ANYTHING with computers but the outcome would be OUR fault as human beings. No right minded person would allow a machine to have total control over humans—particularly when it comes to such important issues as Life and Death. This is one of the most feared aspects of new technology and is a constant source of inspiration to all Science-Horror writers. Of course computers can go wrong and suddenly cause a panic in high places, but there should be sufficient safeguards to stop anything so awful as 'nuclear war by computer error' happening now or in the future.

That's the optimistic view. You will notice I said 'No right minded person would allow . . .' A WRONG minded person in a position of control could tell a computer to do anything required.

You asked a hundred questions before you bought your computer.

Strangely, few buyers of home computers actually know what their computer can do before they buy it.

Most people buy because they feel that they and their families should understand how computers work and how they are used. Many people start by playing games, or by using ready-made educational or business software—which is a good way to get to know the computer keyboard, and may help you with your work, but does not teach you much about computers.

Sadly, that is where many people stop. Just short of one of the greatest excitements man has yet devised.

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Well, that brings us to the end. I hope you have found the text fascinating, illuminating, and provocative—or at least not old plain boring—and that having read '100 things...' you will be feeling more confident and able to take the plunge into the world of computing.

If you are buying a home computer, then choose one of the major brand models from a reputable manufacturer and make sure that you can get a first-class programming manual for the machine as well as the standard manufacturers literature. If you are buying a microcomputer for business use then seek out several people already running your chosen application and learn from their experience and mistakes. You could ask your computer store to put you in touch—reputable ones usually do.

Good luck and happy computing!

M.D.R.

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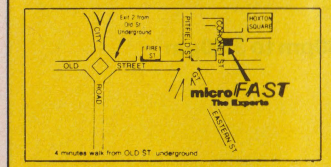

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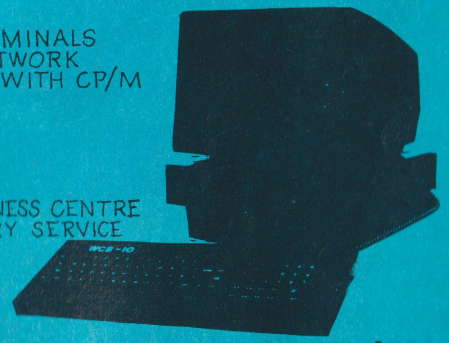

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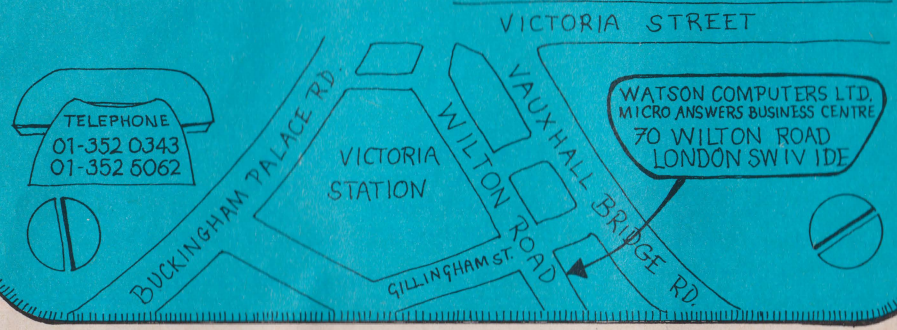

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FORMAT-80

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Format-80 is simple to use. Text entry is as easy as using a typewriter. Editing and formatting is achieved with single key strokes. "D" for delete, "I" for insert, "J" for justify, "C" for centre, etc. Easy to remember commands because they make sense.

What you see is what you get. Format-80 performs virtually any editing and formatting function you can imagine, and displays on the screen the text exactly as it will print out.

It supports all Apple compatible printers. Functions include emboldening, shadow printing, overstrike, sub and superscripting, full proportional spacing, proportional space justification, and much more.

Format-80 also includes a sophisticated mailing list, which comes complete with full sort and selection capabilities. It can hold over 500 names and addresses on a single drive, which may be printed on labels or incorporated into documents. Powerful logic commands make it possible to select only those records which match specified criteria.

The program resides entirely in memory, including the mailing list. All drives are free for text and mailing list data.

It comes complete with a tutorial manual and a concise, easy to use reference manual, plus a handy user reference card, and is supplied on a standard DOS disc. The disc is not copy-protected.

System requirements:
64K APPLE][//e, and most Apple compatible machines.
Disc Drive.
80 Column Card. (supports most 80 column cards)

Also available as an upgrade to existing users of Format-80, including revisions to the reference manual, details of new features, and upgraded software.

Ramview: 80 column board for the //e, upgradeable to 64K.

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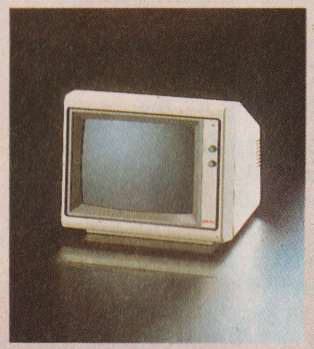

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